

Biochemistry CHEM / MBIO 2370

Course Outline:

GLYCOLYSIS and PENTOSE-PHOSPHATE PATHWAY (~3 Lectures)

- details degradation including structures and enzymes
- alcoholic fermentation
- PPP as an alternate path for glucose oxidation

TCA CYCLE (~1 Lecture)

- detailed description of pyruvate dehydrogenase and the production of acetyl-S-CoA
- details of cycle including structures and enzymes

ELECTRON TRANSPORT AND OXIDATIVE PHOSPHORYLATION (~2 Lectures)

- description of the intermediates and structure
- emphasis on electron flow and energy release
- ATP synthesis
- chemiosmotic mechanism

BALANCING REACTIONS & REGULATION (~1 Lecture)

- anaplerotic or balancing reactions
- regulation of glycolysis and TCA cycle

FATTY ACID OXIDATION (~2 Lectures)

- role of lipases and phospholipases
- transport and the carnitine cycle
- β -oxidation of saturated, straight-chain, even #C atoms
- fate of propionyl-S-CoA derived from odd #C atoms

AMINO ACID OXIDATION & UREA PRODUCTION (~2 Lectures)

- transamination, significance and mechanism
- oxidative deamination
- production of gln and its use N transporter in mammalian blood
- urea cycle
- amino acid degradation including asp, ala, glu and gln
- three examples of degradation pathways: thr/gly/ser, tyr/phe and val

CARBOHYDRATE SYNTHESIS (~4 Lectures)

- the overall reactions of photosynthesis
- the light reactions and generation of ATP and NADPH
- the dark reactions in both C-3 and C-4 plants
- gluconeogenesis
- life on acetate (glyoxylate cycle)
- glycogen synthesis and regulation

LIPID SYNTHESIS (~3 Lectures)

- fatty acid synthesis of palmitic acid
- introduction of unsaturations
- triacylglycerol and membrane phospholipid synthesis

- cholesterol metabolism

N-FIXATION, AMINO ACID NUCLEOTIDE SYNTHESIS (~3 Lectures)

- N-cycle and N-fixation
- N assimilation involving glu and gln
- three examples of amino acid synthesis: ser/gly, val, asp/thr/ile
- purine nucleotide synthesis by the de novo and salvage pathways
- pyrimidine nucleotide synthesis
- nucleotide kinases, pyrophosphorylases, CTP synthesis
- deoxynucleotide synthesis including dTMP

NUCLEIC ACID METABOLISM (~2 Lecture)

- DNA replication including the semi-conservative model and enzymology
- transcription and RNA polymerase c.

PROTEIN SYNTHESIS (~1 Lecture)

- mechanism of translation including initiation, elongation, termination
- genetic code and the Wobble Hypothesis

REGULATION (~1 Lecture)

- control of enzyme activity including branched pathways
- control in catabolic and anabolic operons using the *lac* and *trp* operons as examples